HIGH SPEED QUAD DIGITAL ISOLATORS

FEATURES

- Selectable Failsafe Output (ISO7240CF)
- 25 and 150-Mbps Signaling Rate Options
  - Low Channel-to-Channel Output Skew; 1 ns Max
  - Low Pulse-Width Distortion (PWD); 2 ns Max
  - Low Jitter Content; 1 ns Typ at 150 Mbps
- Typical 25-Year Life at Rated Working Voltage (see application note SLLA197 and Figure 17)
- 4000-V_{peak} Isolation, 560-V_{peak} V_{IORM}
  - UL 1577 , IEC 60747-5-2 (VDE 0884, Rev 2), IEC 61010-1 and CSA Approved
- 4 kV ESD Protection
- Operate With 3.3-V or 5-V Supplies
- High Electromagnetic Immunity (see application report SLLA181)
- –40°C to 125°C Operating Range

APPLICATIONS

- Industrial Fieldbus
- Computer Peripheral Interface
- Servo Control Interface
- Data Acquisition

DESCRIPTION

The ISO7240, ISO7241 and ISO7242 are quad-channel digital isolators with multiple channel configurations and output enable functions. These devices have logic input and output buffers separated by TI's silicon dioxide (SiO_2) isolation barrier. Used in conjunction with isolated power supplies, these devices block high voltage, isolate grounds, and prevent noise currents from entering the local ground and interfering with or damaging sensitive circuitry.

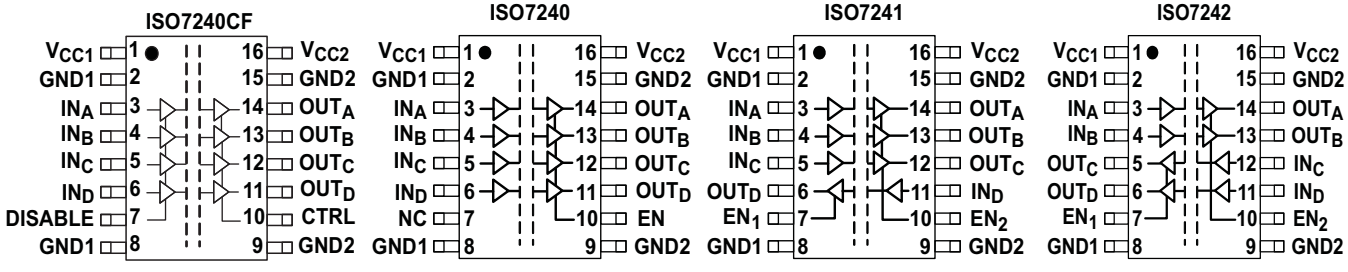
The ISO7240 has all four channels in the same direction while the ISO7241 has three channels the same direction and one channel in opposition. The ISO7242 has two channels in each direction.

The C option devices have TTL input thresholds and a noise-filter at the input that prevents transient pulses from being passed to the output of the device. The M option devices have CMOS Vcc/2 input thresholds and do not have the input noise-filter or the additional propagation delay.

The ISO7240CF has an input disable function on pin 7, and a selectable high or low failsafe-output function with the CTRL pin (pin 10). The failsafe-output is a logic high when a logic-high is placed on the CTRL pin or it is left unconnected. If a logic-low signal is applied to the CTRL pin, the failsafe-output becomes a logic-low output state. The ISO7240CF input disable function prevents data from being passed across the isolation barrier to the output. When the inputs are disabled, the outputs are set by the CTRL pin.

These devices may be powered from either 3.3-V or 5-V supplies on either side in any 3.3-V / 3.3-V, 5-V / 5-V, 5-V / 3.3-V, or 3.3-V / 5-V combination. Note that the signal input pins are 5-V tolerant regardless of the voltage supply level being used.

These devices are characterized for operation over the ambient temperature range of –40°C to 125°C.



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

Table 1. Device Function Table ISO724x (1)

INPUT V_{CC}	OUTPUT V_{CC}	INPUT (IN)	OUTPUT ENABLE (EN)	OUTPUT (OUT)
PU	PU	H	H or Open	H
		L	H or Open	L
		X	L	Z
		Open	H or Open	H
PD	PU	X	H or Open	H
PD	PU	X	L	Z

(1) PU = Powered Up; PD = Powered Down ; X = Irrelevant; H = High Level; L = Low Level

Table 2. ISO7240CF Function Table

V_{CC1}	V_{CC2}	DATA INPUT (IN)	DISABLE INPUT (DISABLE)	FAILSAFE CONTROL INPUT (CTRL)	DATA OUTPUT (OUT)
PU	PU	H	L or Open	X	H
PU	PU	L	L or Open	X	L
X	PU	X	H	H or Open	H
X	PU	X	H	L	L
PD	PU	X	X	H or Open	H
PD	PU	X	X	L	L

AVAILABLE OPTIONS

PRODUCT	SIGNALING RATE	INPUT THRESHOLD	CHANNEL CONFIGURATION	MARKED AS	ORDERING NUMBER(1)
ISO7240CDW	25 Mbps	~1.5 V (TTL) (CMOS compatible)	4/0	ISO7240C	ISO7240CDW (rail)
					ISO7240CDWR (reel)
ISO7240CF	25 Mbps	~1.5 V (TTL) (CMOS compatible)		ISO7240CF	ISO7240CFDW (rail)
					ISO7240CFDWR (reel)
ISO7240MDW	150 Mbps	Vcc/2 (CMOS)		ISO7240M	ISO7240MDW (rail)
					ISO7240MDWR (reel)
ISO7241CDW	25 Mbps	~1.5 V (TTL) (CMOS compatible)	3/1	ISO7241C	ISO7241CDW (rail)
					ISO7241CDWR (reel)
ISO7241MDW	150 Mbps	Vcc/2 (CMOS)		ISO7241M	ISO7241MDW (rail)
					ISO7241MDWR (reel)
ISO7242CDW	25 Mbps	~1.5 V (TTL) (CMOS compatible)	2/2	ISO7242C	ISO7242CDW (rail)
					ISO7242CDWR (reel)
ISO7242MDW	150 Mbps	Vcc/2 (CMOS)		ISO7242M	ISO7242MDW (rail)
					ISO7242MDWR (reel)

(1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI website at www.ti.com.

ABSOLUTE MAXIMUM RATINGS(1)

					VALUE	UNIT
V_{CC}	Supply voltage(2), V_{CC1}, V_{CC2}				–0.5 to 6	V
V_I	Voltage at IN, OUT, EN, DISABLE, CTRL				–0.5 to 6	V
I_O	Output current				±15	mA
ESD	Electrostatic discharge	Human Body Model	JEDEC Standard 22, Test Method A114-C.01	All pins	±4	kV
		Field-Induced-Charged Device Model	JEDEC Standard 22, Test Method C101		±1	
		Machine Model	ANSI/ESDS5.2-1996		±200	V
T_J	Maximum junction temperature				170	°C

(1) Stresses beyond those listed under *absolute maximum ratings* may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under *recommended operating conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
(2) All voltage values are with respect to network ground terminal and are peak voltage values.

RECOMMENDED OPERATING CONDITIONS

			MIN	TYP	MAX	UNIT
V_{CC}	Supply voltage(1), V_{CC1}, V_{CC2}		3.15		5.5	V
I_{OH}	High-level output current				4	mA
I_{OL}	Low-level output current		–4			mA
t_{ui}	Input pulse width	ISO724xC	40			ns
		ISO724xM	6.67	5		
$1/t_{ui}$	Signaling rate	ISO724xC	0	30(2)	25	Mbps
		ISO724xM	0	200(2)	150	
V_{IH}	High-level input voltage (IN)	ISO724xM	0.7 V_{CC}		V_{CC}	V
V_{IL}	Low-level input voltage (IN)		0		0.3 V_{CC}	V
V_{IH}	High-level input voltage (IN, DISABLE, CTRL, EN)	ISO724xC	2		V_{CC}	V
V_{IL}	Low-level input voltage (IN, DISABLE, CTRL, EN)		0		0.8	V
T_J	Junction temperature				150	°C
H	External magnetic field-strength immunity per IEC 61000-4-8 and IEC 61000-4-9 certification				1000	A/m

(1) For the 5-V operation, V_{CC1} or V_{CC2} is specified from 4.5 V to 5.5 V.
For the 3-V operation, V_{CC1} or V_{CC2} is specified from 3.15 V to 3.6 V.
(2) Typical value at room temperature and well-regulated power supply.

ELECTRICAL CHARACTERISTICS: V_{CC1} and V_{CC2} at 5-V(1) OPERATION

, over recommended operating conditions (unless otherwise noted)

PARAMETER			TEST CONDITIONS	MIN	TYP	MAX	UNIT
SUPPLY CURRENT							
I_{CC1}	ISO7240C/M	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_2 at 3 V		1	3	mA
		25 Mbps			7	10.5	
	ISO7241C/M	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_1 at 3 V, EN_2 at 3 V		6.5	10	mA
		25 Mbps			12	18	
	ISO7242C/M	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_1 at 3 V, EN_2 at 3 V		10	16	mA
		25 Mbps			15	24	
I_{CC2}	ISO7240C/M	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_2 at 3 V		15	22	mA
		25 Mbps			17	25	
	ISO7241C/M	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_1 at 3 V, EN_2 at 3 V		13	20	mA
		25 Mbps			18	28	
	ISO7242C/M	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_1 at 3 V, EN_2 at 3 V		10	16	mA
		25 Mbps			15	24	
ELECTRICAL CHARACTERISTICS							
I_{OFF}	Sleep mode output current		EN at 0 V, Single channel		0		µA
V_{OH}	High-level output voltage		I_{OH} = –4 mA, See Figure 1	V_{CC} – 0.8			V
			I_{OH} = –20 µA, See Figure 1	V_{CC} – 0.1			
V_{OL}	Low-level output voltage		I_{OL} = 4 mA, See Figure 1			0.4	V
			I_{OL} = 20 µA, See Figure 1			0.1	
$V_{I(HYS)}$	Input voltage hysteresis				150		mV
I_{IH}	High-level input current		IN from 0 V to V_{CC}			10	µA
I_{IL}	Low-level input current			–10			
C_I	Input capacitance to ground		IN at V_{CC}, V_I = 0.4 sin (4E6πt)		2		pF
CMTI	Common-mode transient immunity		V_I = V_{CC} or 0 V, See Figure 5	25	50		kV/µs

(1) For the 5-V operation, V_{CC1} or V_{CC2} is specified from 4.5 V to 5.5 V.
For the 3-V operation, V_{CC1} or V_{CC2} is specified from 3.15 V to 3.6 V.

SWITCHING CHARACTERISTICS: V_{CC1} and V_{CC2} at 5-V OPERATION

over recommended operating conditions (unless otherwise noted)

PARAMETER			TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}, t_{PHL}	Propagation delay	ISO724xC	See Figure 1	18		42	ns
PWD	Pulse-width distortion(1) $\lvert t_{PHL} - t_{PLH} \rvert$	ISO724xC	See Figure 1			2.5	ns
t_{PLH}, t_{PHL}	Propagation delay	ISO724xM	See Figure 1	10		23	ns
PWD	Pulse-width distortion(1) $\lvert t_{PHL} - t_{PLH} \rvert$	ISO724xM	See Figure 1		1	2	ns
$t_{sk(pp)}$	Part-to-part skew (2)	ISO724xC				8	ns
		ISO724xM			0	3	ns
$t_{sk(o)}$	Channel-to-channel output skew (3)	ISO724xC				2	ns
		ISO724xM			0	1	ns
t_r	Output signal rise time		See Figure 1		2		ns
t_f	Output signal fall time		See Figure 1		2		ns
t_{PHZ}	Propagation delay, high-level-to-high-impedance output		See Figure 2		15	20	ns
t_{PZH}	Propagation delay, high-impedance-to-high-level output		See Figure 2		15	20	ns
t_{PLZ}	Propagation delay, low-level-to-high-impedance output		See Figure 2		15	20	ns
t_{PZL}	Propagation delay, high-impedance-to-low-level output		See Figure 2		15	20	ns
t_{fs}	Failsafe output delay time from input power loss		See Figure 3		12		µs
t_{wake}	Wake time from input disable		See Figure 4		15		µs
$t_{jit(pp)}$	Peak-to-peak eye-pattern jitter	ISO724xM	150 Mbps NRZ data input, Same polarity input on all channels, See Figure 6		1		ns

(1) Also referred to as pulse skew.
(2) $t_{sk(pp)}$ is the magnitude of the difference in propagation delay times between any specified terminals of two devices when both devices operate with the same supply voltages, at the same temperature, and have identical packages and test circuits.
(3) $t_{sk(o)}$ is the skew between specified outputs of a single device with all driving inputs connected together and the outputs switching in the same direction while driving identical specified loads.

ELECTRICAL CHARACTERISTICS: V_{CC1} at 5-V, V_{CC2} at 3.3-V(1) OPERATION

over recommended operating conditions (unless otherwise noted)

PARAMETER			TEST CONDITIONS		MIN	TYP	MAX	UNIT
SUPPLY CURRENT								
I_{CC1}	ISO7240C/M	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_2 at 3 V			1	3	mA
		25 Mbps				7	10.5	
	ISO7241C/M	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_1 at 3 V, EN_2 at 3 V			6.5	10	mA
		25 Mbps				12	18	
	ISO7242C/M	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_1 at 3 V, EN_2 at 3 V			10	16	mA
		25 Mbps				15	24	
I_{CC2}	ISO7240C/M	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_2 at 3 V			9.5	15	mA
		25 Mbps				10.5	17	
	ISO7241C/M	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_1 at 3 V, EN_2 at 3 V			8	13	mA
		25 Mbps				11.5	18	
	ISO7242C/M	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_1 at 3 V, EN_2 at 3 V			6	10	mA
		25 Mbps				9	14	
ELECTRICAL CHARACTERISTICS								
I_{OFF}	Sleep mode output current		EN at 0 V, Single channel			0		µA
V_{OH}	High-level output voltage		I_{OH} = –4 mA, See Figure 1	ISO7240	V_{CC} – 0.4			V
				ISO724x (5-V side)	V_{CC} – 0.8			
			I_{OH} = –20 µA, See Figure 1		V_{CC} – 0.1			
V_{OL}	Low-level output voltage		I_{OL} = 4 mA, See Figure 1				0.4	V
			I_{OL} = 20 µA, See Figure 1				0.1	
$V_{I(HYS)}$	Input voltage hysteresis					150		mV
I_{IH}	High-level input current		IN from 0 V to V_{CC}				10	µA
I_{IL}	Low-level input current				–10			
C_I	Input capacitance to ground		IN at V_{CC}, V_I = 0.4 sin (4E6πt)			2		pF
CMTI	Common-mode transient immunity		V_I = V_{CC} or 0 V, See Figure 5		25	50		kV/µs

(1) For the 5-V operation, V_{CC1} or V_{CC2} is specified from 4.5 V to 5.5 V.
For the 3-V operation, V_{CC1} or V_{CC2} is specified from 3.15 V to 3.6 V.

SWITCHING CHARACTERISTICS: V_{CC1} at 5-V, V_{CC2} at 3.3-V OPERATION

over recommended operating conditions (unless otherwise noted)

PARAMETER			TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}, t_{PHL}	Propagation delay	ISO724xC	See Figure 1	20		50	ns
PWD	Pulse-width distortion(1) $\lvert t_{PHL} - t_{PLH} \rvert$	ISO724xC				3	ns
t_{PLH}, t_{PHL}	Propagation delay	ISO724xM		12		29	ns
PWD	Pulse-width distortion(1) $\lvert t_{PHL} - t_{PLH} \rvert$	ISO724xM			1	2	ns
$t_{sk(pp)}$	Part-to-part skew (2)	ISO724xC				10	ns
		ISO724xM			0	5	ns
$t_{sk(o)}$	Channel-to-channel output skew (3)	ISO724xC				3	ns
		ISO724xM			0	1	ns
t_r	Output signal rise time		See Figure 1		2		ns
t_f	Output signal fall time				2		ns
t_{PHZ}	Propagation delay, high-level-to-high-impedance output		See Figure 2		15	20	ns
t_{PZH}	Propagation delay, high-impedance-to-high-level output				15	20	ns
t_{PLZ}	Propagation delay, low-level-to-high-impedance output				15	20	ns
t_{PZL}	Propagation delay, high-impedance-to-low-level output				15	20	ns
t_{fs}	Failsafe output delay time from input power loss		See Figure 3		18		µs
t_{wake}	Wake time from input disable		See Figure 4		15		µs
$t_{jit(pp)}$	Peak-to-peak eye-pattern jitter	ISO724xM	150 Mbps PRBS NRZ data input, Same polarity input on all channels, See Figure 6		1		ns

(1) Also known as pulse skew
(2) $t_{sk(pp)}$ is the magnitude of the difference in propagation delay times between any specified terminals of two devices when both devices operate with the same supply voltages, at the same temperature, and have identical packages and test circuits.
(3) $t_{sk(o)}$ is the skew between specified outputs of a single device with all driving inputs connected together and the outputs switching in the same direction while driving identical specified loads.

ELECTRICAL CHARACTERISTICS: V_{CC1} at 3.3-V, V_{CC2} at 5-V(1) OPERATION

over recommended operating conditions (unless otherwise noted)

PARAMETER			TEST CONDITIONS		MIN	TYP	MAX	UNIT
SUPPLY CURRENT								
I_{CC1}	ISO7240C/M	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_2 at 3 V			0.5	1	mA
		25 Mbps				3	5	
	ISO7241C/M	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_1 at 3 V, EN_2 at 3 V			4	7	mA
		25 Mbps				6.5	11	
	ISO724C/M	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_1 at 3 V, EN_2 at 3 V			6	10	mA
		25 Mbps				9	14	
I_{CC2}	ISO7240C/M	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_2 at 3 V			15	22	mA
		25 Mbps				17	25	
	ISO7241C/M	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_1 at 3 V, EN_2 at 3 V			13	20	mA
		25 Mbps				18	28	
	ISO7242C/M	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_1 at 3 V, EN_2 at 3 V			10	16	mA
		25 Mbps				15	24	
ELECTRICAL CHARACTERISTICS								
I_{OFF}	Sleep mode output current		EN at 0 V, Single channel			0		µA
V_{OH}	High-level output voltage		I_{OH} = –4 mA, See Figure 1	ISO7240	V_{CC} – 0.4			V
				ISO724x (5-V side)	V_{CC} – 0.8			
			I_{OH} = –20 µA, See Figure 1		V_{CC} – 0.1			
V_{OL}	Low-level output voltage		I_{OL} = 4 mA, See Figure 1				0.4	V
			I_{OL} = 20 µA, See Figure 1				0.1	
$V_{I(HYS)}$	Input voltage hysteresis					150		mV
I_{IH}	High-level input current		IN from 0 V to V_{CC}				10	µA
I_{IL}	Low-level input current				–10			
C_I	Input capacitance to ground		IN at V_{CC}, V_I = 0.4 sin (4E6πt)			2		pF
CMTI	Common-mode transient immunity		V_I = V_{CC} or 0 V, See Figure 5		25	50		kV/µs

(1) For the 5-V operation, V_{CC1} or V_{CC2} is specified from 4.5 V to 5.5 V.
For the 3-V operation, V_{CC1} or V_{CC2} is specified from 3.15 V to 3.6 V.

SWITCHING CHARACTERISTICS: V_{CC1} at 3.3-V and V_{CC2} at 5-V OPERATION

over recommended operating conditions (unless otherwise noted)

PARAMETER			TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}, t_{PHL}	Propagation delay	ISO724xC	See Figure 1	22		51	ns
PWD	Pulse-width distortion(1) $\lvert t_{PHL} - t_{PLH} \rvert$	ISO724xC	See Figure 1			3	ns
t_{PLH}, t_{PHL}	Propagation delay	ISO724xM	See Figure 1	12		30	ns
PWD	Pulse-width distortion(1) $\lvert t_{PHL} - t_{PLH} \rvert$	ISO724xM	See Figure 1		1	2	ns
$t_{sk(pp)}$	Part-to-part skew (2)	ISO724xC				10	ns
		ISO724xM			0	5	ns
$t_{sk(o)}$	Channel-to-channel output skew (3)	ISO724xC				2.5	ns
		ISO724xM			0	1	ns
t_r	Output signal rise time		See Figure 1		2		ns
t_f	Output signal fall time		See Figure 1		2		ns
t_{PHZ}	Propagation delay, high-level-to-high-impedance output		See Figure 2		15	20	ns
t_{PZH}	Propagation delay, high-impedance-to-high-level output		See Figure 2		15	20	ns
t_{PLZ}	Propagation delay, low-level-to-high-impedance output		See Figure 2		15	20	ns
t_{PZL}	Propagation delay, high-impedance-to-low-level output		See Figure 2		15	20	ns
t_{fs}	Failsafe output delay time from input power loss		See Figure 3		12		µs
t_{wake}	Wake time from input disable		See Figure 4		15		µs
$t_{jit(pp)}$	Peak-to-peak eye-pattern jitter	ISO724xM	150 Mbps NRZ data input, Same polarity input on all channels, See Figure 6		1		ns

(1) Also known as pulse skew
(2) $t_{sk(pp)}$ is the magnitude of the difference in propagation delay times between any specified terminals of two devices when both devices operate with the same supply voltages, at the same temperature, and have identical packages and test circuits.
(3) $t_{sk(o)}$ is the skew between specified outputs of a single device with all driving inputs connected together and the outputs switching in the same direction while driving identical specified loads.

ELECTRICAL CHARACTERISTICS: V_{CC1} and V_{CC2} at 3.3 V(1) OPERATION

over recommended operating conditions (unless otherwise noted)

PARAMETER			TEST CONDITIONS	MIN	TYP	MAX	UNIT
SUPPLY CURRENT							
I_{CC1}	ISO7240C/M	Quiescent	V_I = V_{CC} or 0 V, all channels, no load, EN_2 at 3 V		0.5	1	mA
		25 Mbps			3	5	
	ISO7241C/M	Quiescent	V_I = V_{CC} or 0 V, all channels, no load, EN_1 at 3 V, EN_2 at 3 V		4	7	mA
		25 Mbps			6.5	11	
	ISO7242C/M	Quiescent	V_I = V_{CC} or 0 V, all channels, no load, EN_1 at 3 V, EN_2 at 3 V		6	10	
		25 Mbps			9	14	
I_{CC2}	ISO7240C/M	Quiescent	V_I = V_{CC} or 0 V, all channels, no load, EN_2 at 3 V		9.5	15	mA
		25 Mbps			10.5	17	
	ISO7241C/M	Quiescent	V_I = V_{CC} or 0 V, all channels, no load, EN_1 at 3 V, EN_2 at 3 V		8	13	mA
		25 Mbps			11.5	18	
	ISO7242C/M	Quiescent	V_I = V_{CC} or 0 V, all channels, no load, EN_1 at 3 V, EN_2 at 3 V		6	10	
		25 Mbps			9	14	
ELECTRICAL CHARACTERISTICS							
I_{OFF}	Sleep mode output current		EN at 0 V, single channel		0		µA
V_{OH}	High-level output voltage		I_{OH} = –4 mA, See Figure 1	V_{CC} – 0.4			V
			I_{OH} = –20 µA, See Figure 1	V_{CC} – 0.1			
V_{OL}	Low-level output voltage		I_{OL} = 4 mA, See Figure 1			0.4	V
			I_{OL} = 20 µA, See Figure 1			0.1	
$V_{I(HYS)}$	Input voltage hysteresis				150		mV
I_{IH}	High-level input current		IN from 0 V or V_{CC}			10	µA
I_{IL}	Low-level input current			–10			
C_I	Input capacitance to ground		IN at V_{CC}, V_I = 0.4 sin (4E6πt)		2		pF
CMTI	Common-mode transient immunity		V_I = V_{CC} or 0 V, See Figure 5	25	50		kV/µs

(1) For the 5-V operation, V_{CC1} or V_{CC2} is specified from 4.5 V to 5.5 V.
For the 3-V operation, V_{CC1} or V_{CC2} is specified from 3.15 V to 3.6 V.

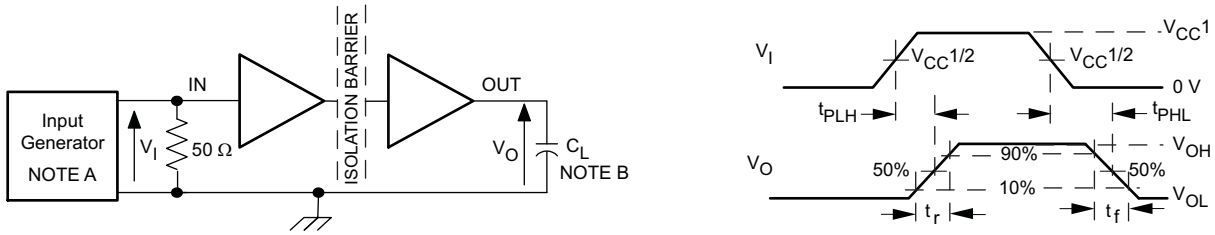
SWITCHING CHARACTERISTICS: V_{CC1} and V_{CC2} at 3.3-V OPERATION

over recommended operating conditions (unless otherwise noted)

PARAMETER			TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}, t_{PHL}	Propagation delay	ISO724xC	See Figure 1	25		56	ns
PWD	Pulse-width distortion $\lvert t_{PHL} - t_{PLH} \rvert$ (1)	ISO724xC	See Figure 1			4	ns
t_{PLH}, t_{PHL}	Propagation delay	ISO724xM	See Figure 1	12		34	ns
PWD	Pulse-width distortion $\lvert t_{PHL} - t_{PLH} \rvert$ (1)	ISO724xM	See Figure 1		1	2	ns
$t_{sk(pp)}$	Part-to-part skew (2)	ISO724xC				10	ns
		ISO724xM			0	5	ns
$t_{sk(o)}$	Channel-to-channel output skew (3)	ISO724xC				3.5	ns
		ISO724xM			0	1	ns
t_r	Output signal rise time		See Figure 1		2		ns
t_f	Output signal fall time		See Figure 1		2		ns
t_{PHZ}	Propagation delay, high-level-to-high-impedance output		See Figure 2		15	20	ns
t_{PZH}	Propagation delay, high-impedance-to-high-level output		See Figure 2		15	20	ns
t_{PLZ}	Propagation delay, low-level-to-high-impedance output		See Figure 2		15	20	ns
t_{PZL}	Propagation delay, high-impedance-to-low-level output		See Figure 2		15	20	ns
t_{fs}	Failsafe output delay time from input power loss		See Figure 3		18		µs
t_{wake}	Wake time from input disable		See Figure 4		15		µs
$t_{jit(pp)}$	Peak-to-peak eye-pattern jitter	ISO724xM	150 Mbps PRBS NRZ data input, same polarity input on all channels, See Figure 6		1		ns

(1) Also referred to as pulse skew.
(2) $t_{sk(pp)}$ is the magnitude of the difference in propagation delay times between any specified terminals of two devices when both devices operate with the same supply voltages, at the same temperature, and have identical packages and test circuits.
(3) $t_{sk(o)}$ is the skew between specified outputs of a single device with all driving inputs connected together and the outputs switching in the same direction while driving identical specified loads.

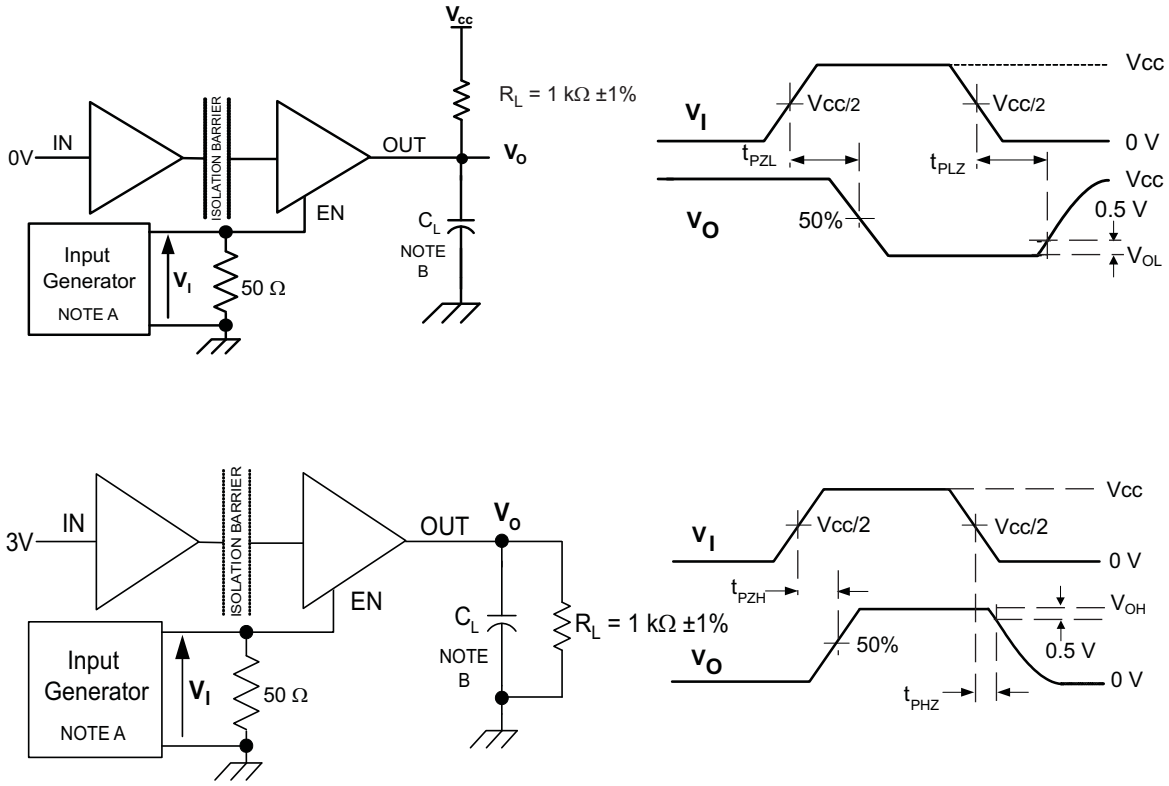
PARAMETER MEASUREMENT INFORMATION



A. The input pulse is supplied by a generator having the following characteristics: PRR ≤ 50 kHz, 50% duty cycle, t_r ≤ 3 ns, t_f ≤ 3 ns, Z_O = 50Ω.

B. C_L = 15 pF and includes instrumentation and fixture capacitance within ±20%.

Figure 1. Switching Characteristic Test Circuit and Voltage Waveforms

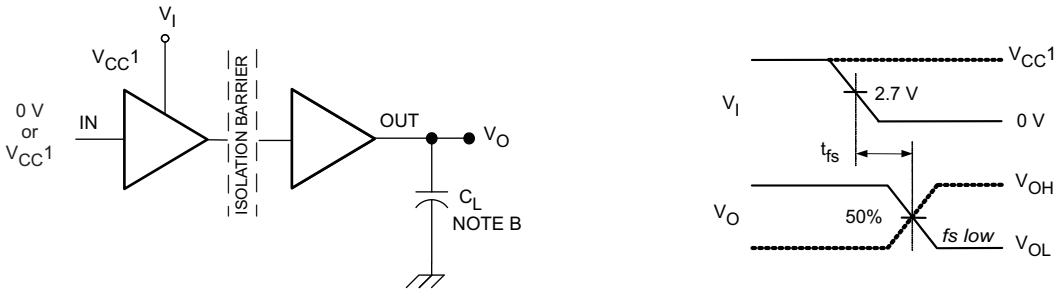


A. The input pulse is supplied by a generator having the following characteristics: PRR ≤ 50 kHz, 50% duty cycle, t_r ≤ 3 ns, t_f ≤ 3 ns, Z_O = 50Ω.

B. C_L = 15 pF and includes instrumentation and fixture capacitance within ±20%.

Figure 2. Enable/Disable Propagation Delay Time Test Circuit and Waveform

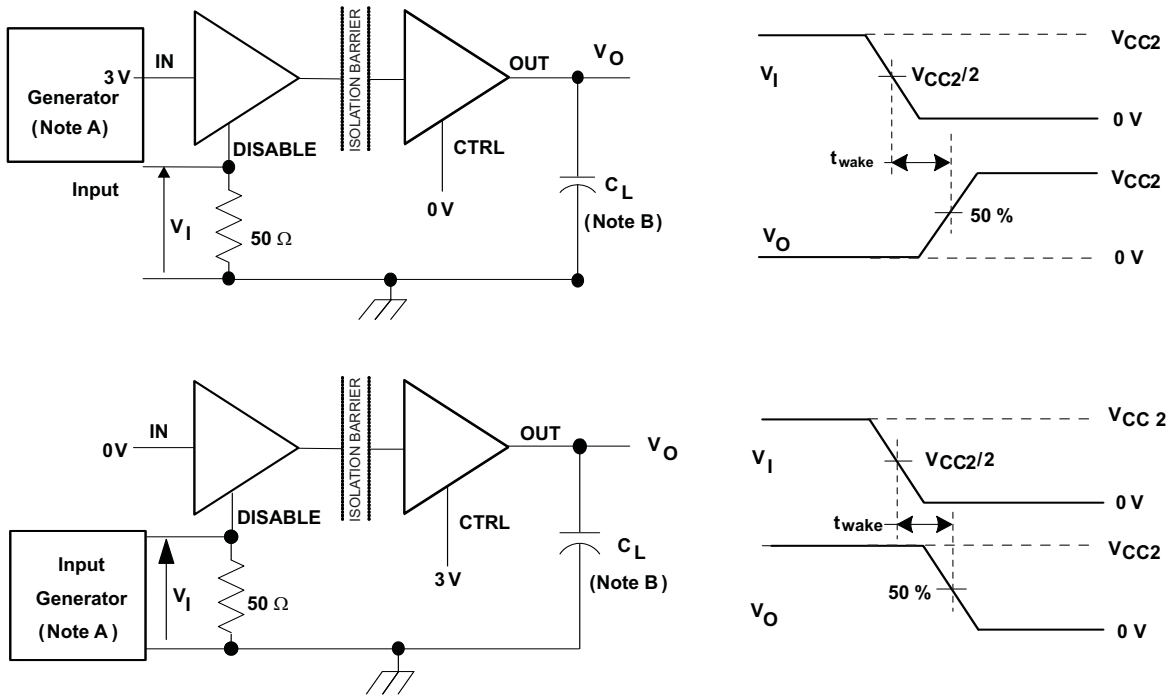
PARAMETER MEASUREMENT INFORMATION (continued)



A. C_L = 15 pF and includes instrumentation and fixture capacitance within ±20%.

B. The input pulse is supplied by a generator having the following characteristics: PRR ≤ 50 kHz, 50% duty cycle, t_r ≤ 3 ns, t_f ≤ 3 ns, Z_O = 50Ω.

Figure 3. Failsafe Delay Time Test Circuit and Voltage Waveforms

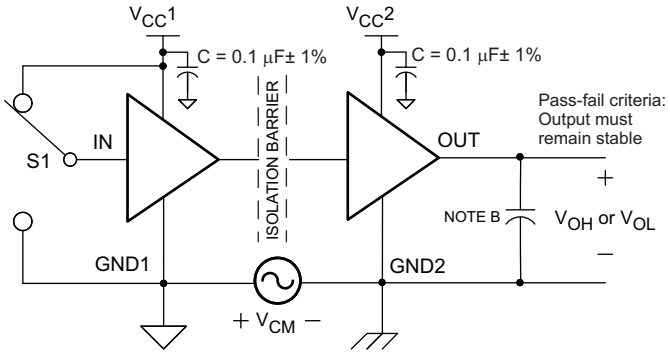


NOTE: Which ever test yields the longest time is used in this datasheet

A. Whichever test yields the longest time is used in this data sheet.

Figure 4. Wake Time From Input Disable Test Circuit and Voltage Waveforms

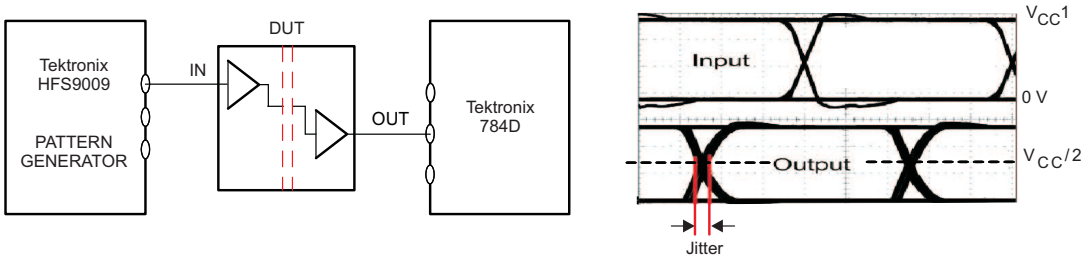
PARAMETER MEASUREMENT INFORMATION (continued)



A. C_L = 15 pF and includes instrumentation and fixture capacitance within ±20%.

B. The input pulse is supplied by a generator having the following characteristics: PRR ≤ 50 kHz, 50% duty cycle, t_r ≤ 3 ns, t_f ≤ 3 ns, Z_O = 50Ω.

Figure 5. Common-Mode Transient Immunity Test Circuit and Voltage Waveform



NOTE: PRBS bit pattern run length is 2^{16} – 1. Transition time is 800 ps. NRZ data input has no more than five consecutive 1s or 0s.

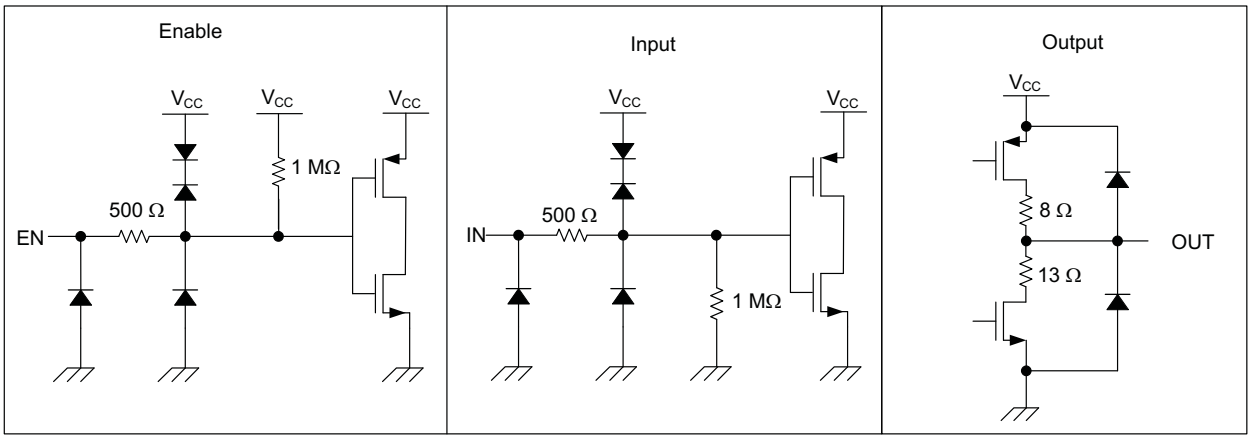
Figure 6. Peak-to-Peak Eye-Pattern Jitter Test Circuit and Voltage Waveform

DEVICE INFORMATION

PACKAGE CHARACTERISTICS

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
L(I01)	Minimum air gap (Clearance)	Shortest terminal-to-terminal distance through air	8.34			mm
L(I02)	Minimum external tracking (Creepage)	Shortest terminal-to-terminal distance across the package surface	8.1			mm
	Minimum Internal Gap (Internal Clearance)	Distance through the insulation	0.008			mm
R_{IO}	Isolation resistance	Input to output, V_{IO} = 500 V, all pins on each side of the barrier tied together creating a two-terminal device		$>10^{12}$		Ω
C_{IO}	Barrier capacitance Input to output	V_I = 0.4 sin (4E6πt)		2		pF
C_I	Input capacitance to ground	V_I = 0.4 sin (4E6πt)		2		pF

DEVICE I/O SCHEMATICS



REGULATORY INFORMATION

VDE	CSA	UL
Certified according to IEC 60747-5-2	Approved under CSA Component Acceptance Notice	Recognized under 1577 Component Recognition Program(1)
File Number: 40016131	File Number: 1698195	File Number: E181974

(1) Production tested ≥ 3000 Vrms for 1 second in accordance with UL 1577.

THERMAL CHARACTERISTICS

over recommended operating conditions (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
θ_{JA}	Junction-to-air	Low-K Thermal Resistance(1)		168		°C/W
		High-K Thermal Resistance		96.1		
θ_{JB}	Junction-to-Board Thermal Resistance			61		°C/W
θ_{JC}	Junction-to-Case Thermal Resistance			48		°C/W
P_D	Device Power Dissipation	V_{CC1} = V_{CC2} = 5.5 V, T_J = 150°C, C_L = 15 pF, Input a 50% duty cycle square wave			220	mW

(1) Tested in accordance with the Low-K or High-K thermal metric definitions of EIA/JESD51-3 for leaded surface mount packages.

TYPICAL CHARACTERISTIC CURVES

ISO7240C/M RMS SUPPLY CURRENT vs SIGNALING RATE

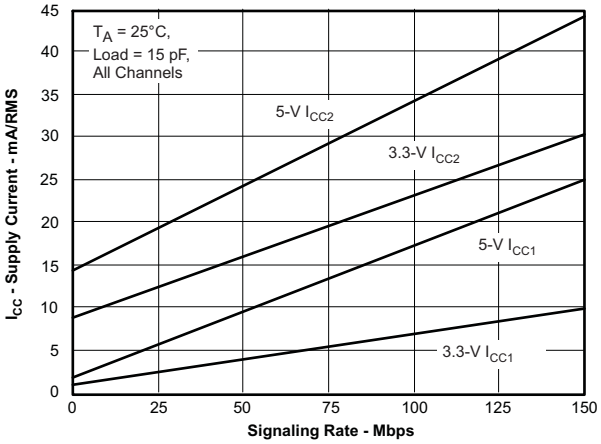


Figure 7.

ISO7241C/M RMS SUPPLY CURRENT vs SIGNALING RATE

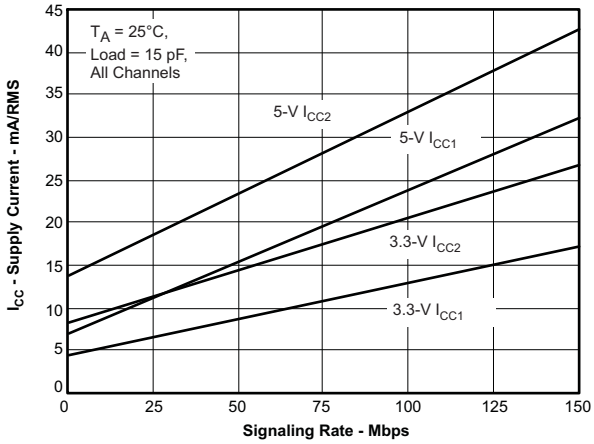


Figure 8.

ISO7242C/M RMS SUPPLY CURRENT vs SIGNALING RATE

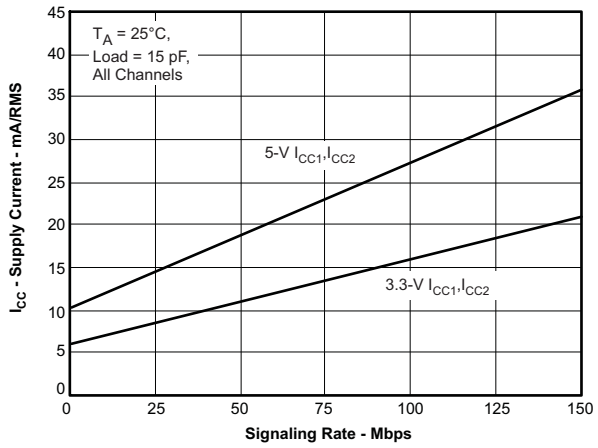


Figure 9.

PROPAGATION DELAY vs FREE-AIR TEMPERATURE

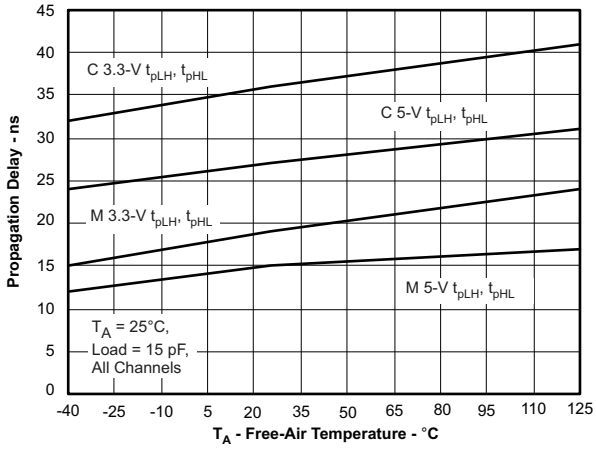


Figure 10.

TYPICAL CHARACTERISTIC CURVES (continued)

INPUT VOLTAGE THRESHOLD vs FREE-AIR TEMPERATURE

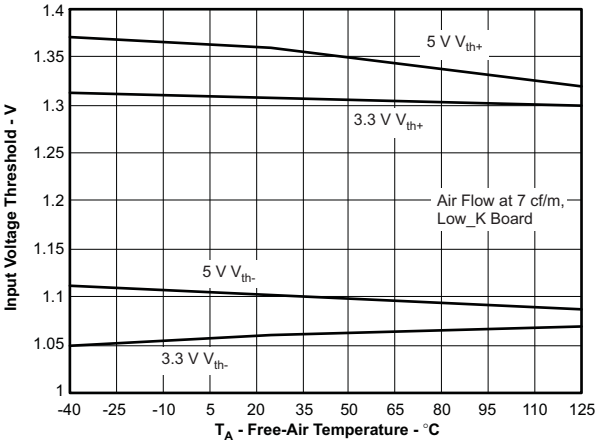


Figure 11.

V_{CC1} FAILSAFE THRESHOLD vs FREE-AIR TEMPERATURE

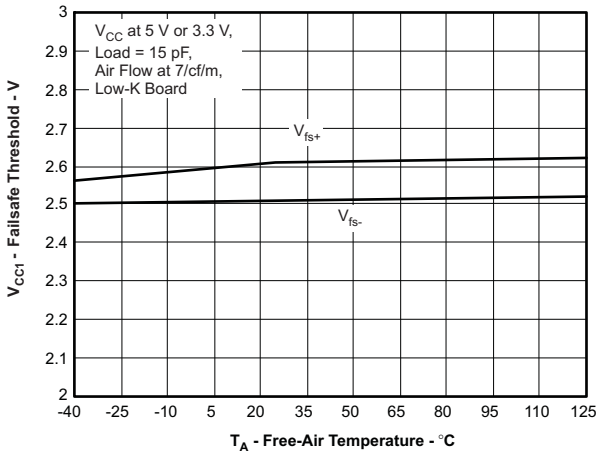


Figure 12.

HIGH-LEVEL OUTPUT CURRENT vs HIGH-LEVEL OUTPUT VOLTAGE

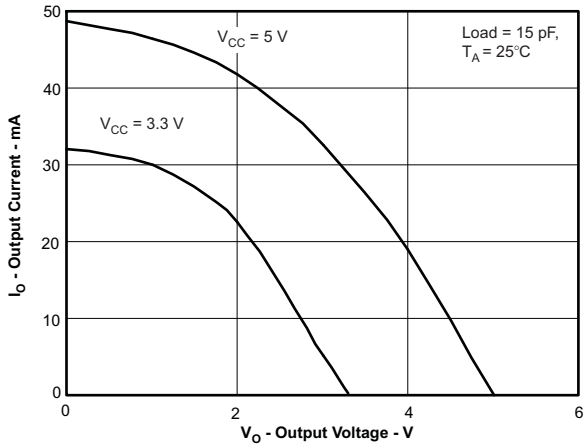


Figure 13.

LOW-LEVEL OUTPUT CURRENT vs LOW-LEVEL OUTPUT VOLTAGE

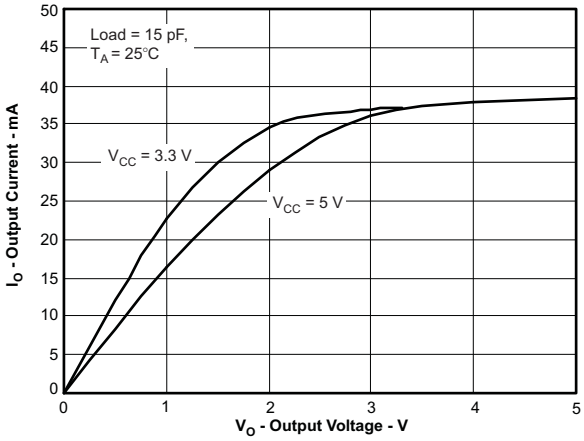


Figure 14.

APPLICATION INFORMATION

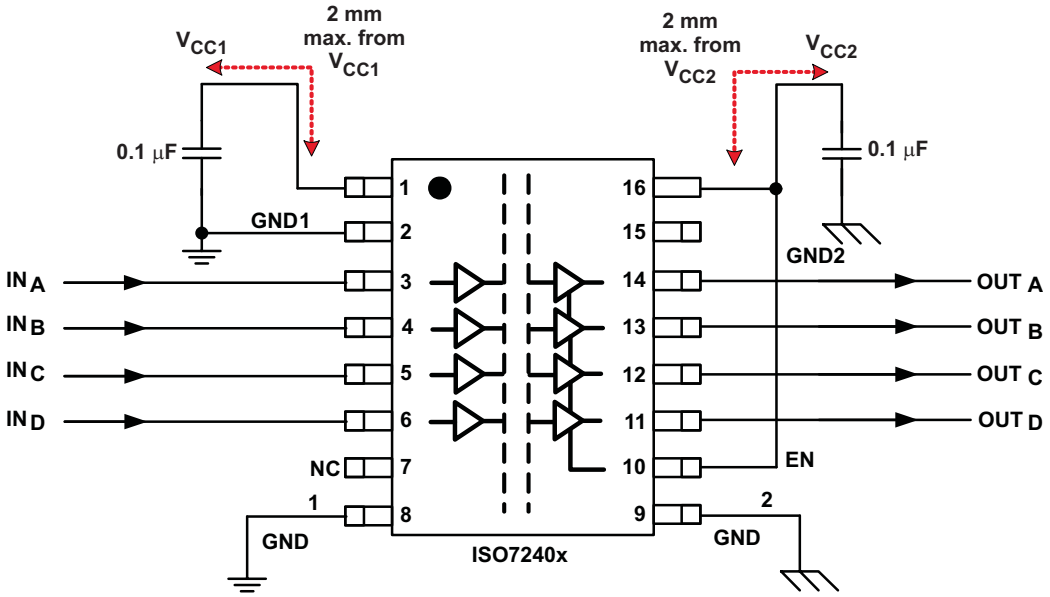


Figure 15. Typical ISO7240x Application Circuit

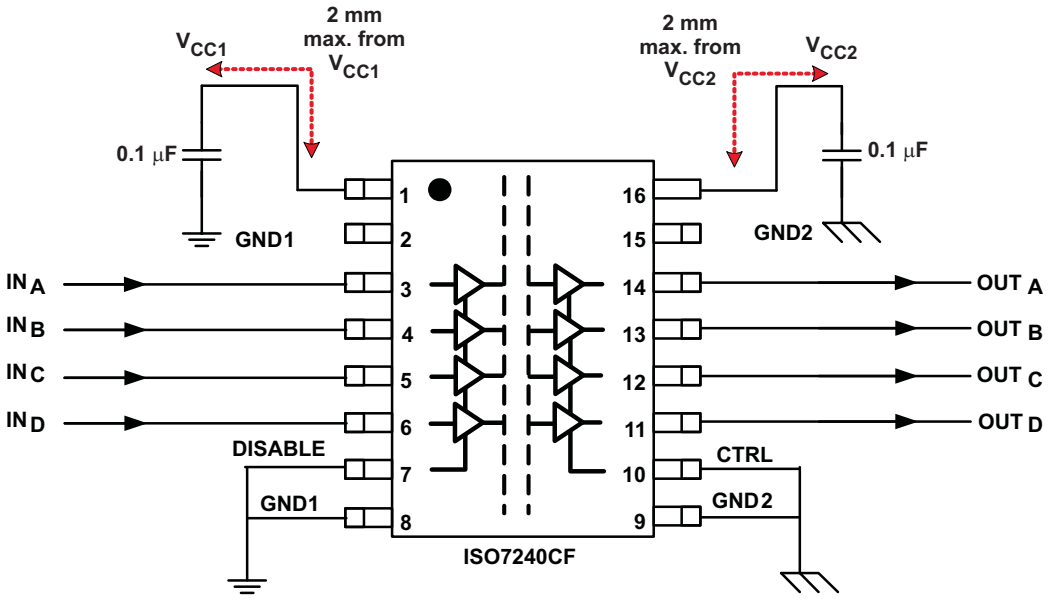


Figure 16. Typical ISO7240CF Failsafe-Low Application Circuit

LIFE EXPECTANCY vs. WORKING VOLTAGE

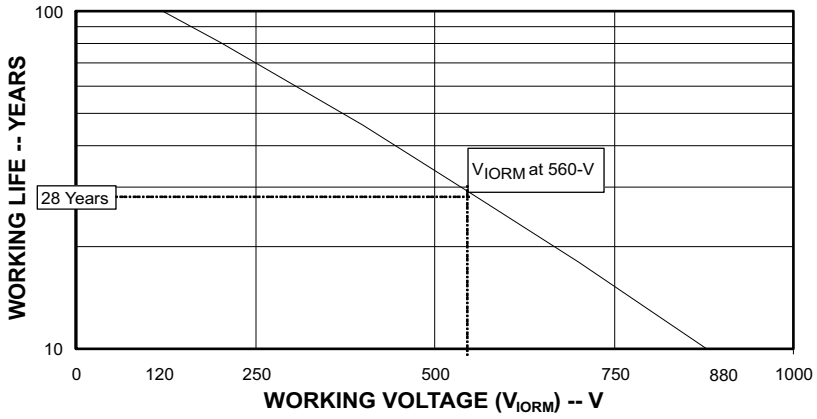


Figure 17. Time-Dependant Dielectric Breakdown Testing Results

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
ISO7240CDW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7240CDWG4	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7240CDWR	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7240CDWRG4	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7240CFDW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7240CFDWG4	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7240CFDWR	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7240CFDWRG4	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7240MDW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7240MDWG4	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7240MDWR	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7240MDWRG4	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7241CDW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7241CDWG4	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7241CDWR	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7241CDWRG4	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7241MDW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7241MDWG4	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7241MDWR	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7241MDWRG4	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7242CDW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7242CDWG4	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7242CDWR	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7242CDWRG4	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7242MDW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR

Orderable Device	Status [1]	Package Type	Package Drawing	Pins	Package Qty	Eco Plan [2]	Lead/Ball Finish	MSL Peak Temp [3]
ISO7242MDWG4	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7242MDWR	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7242MDWRG4	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR

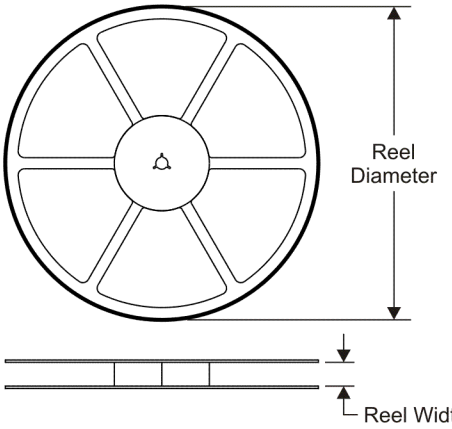
[1] The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

[2] Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

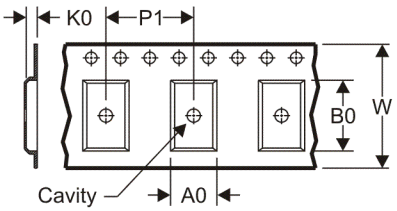
[3] MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

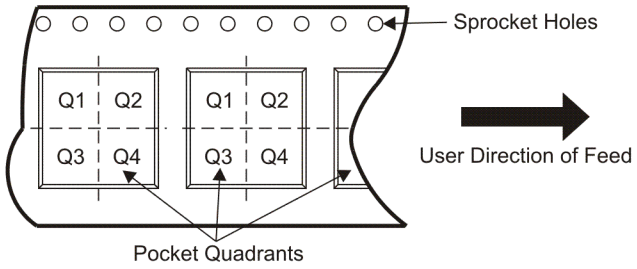


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

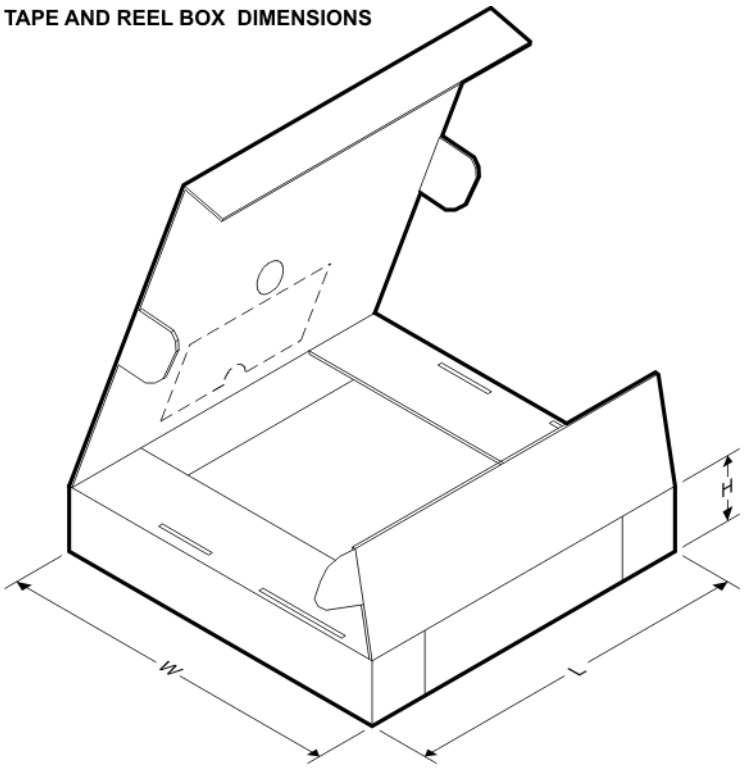
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
ISO7240CDWR	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1
ISO7240CFDWR	SOIC	DW	16	2000	330.0	16.4	10.9	10.78	3.0	12.0	16.0	Q1
ISO7240MDWR	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1
ISO7241CDWR	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1
ISO7241MDWR	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1
ISO7242CDWR	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1
ISO7242MDWR	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1

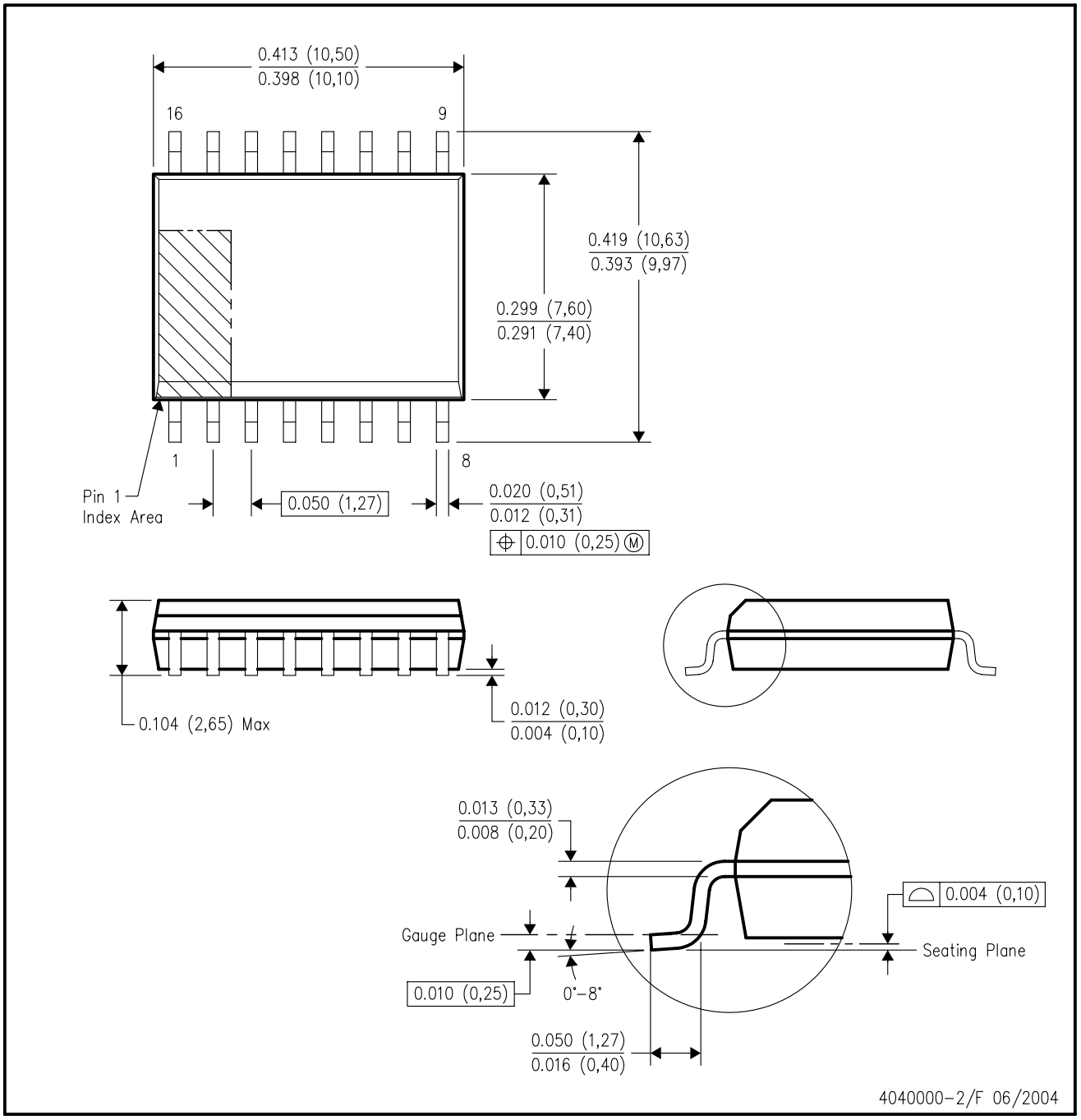
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
ISO7240CDWR	SOIC	DW	16	2000	358.0	335.0	35.0
ISO7240CFDWR	SOIC	DW	16	2000	358.0	335.0	35.0
ISO7240MDWR	SOIC	DW	16	2000	358.0	335.0	35.0
ISO7241CDWR	SOIC	DW	16	2000	358.0	335.0	35.0
ISO7241MDWR	SOIC	DW	16	2000	358.0	335.0	35.0
ISO7242CDWR	SOIC	DW	16	2000	358.0	335.0	35.0
ISO7242MDWR	SOIC	DW	16	2000	358.0	335.0	35.0

DW (R–PDSO–G16) PLASTIC SMALL–OUTLINE PACKAGE



NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
D. Falls within JEDEC MS–013 variation AA.

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